

An unrecognised form of hydrogen sulphide keratoconjunctivitis

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Occupational eye injuries caused by hydrogen sulphide gas have been recognised for at least two centuries and remain a cause of considerable morbidity in many industrial situations. We report on several cases of hydrogen sulphide toxicity affecting workers in the sausage manufacturing industry, a previously unrecognised occupational hazard.

Case reports

In 1988 six men were referred to St Paul's Eye Hospital after the onset of acutely painful, red eyes while at work at a local sausage casing factory. These patients prepared sheep intestine for sausage skin manufacture.

Ocular examination showed bilateral blepharospasm, photophobia and lacrimation, intense conjunctival injection, and superficial punctate corneal erosions. There were no other abnormal ocular findings and results of systemic examination were normal.

Treatment was with chloramphenicol eye ointment. All patients were reviewed within 24 hours of presentation. In all cases the symptoms had resolved and slit lamp biomicroscopy showed resolution of the superficial punctate corneal erosions. On further questioning, none of the patients had been able to work until his symptoms had resolved; this interval ranged from 12 to 24 hours.

Investigation

Traditional sausage manufacture requires the use of sheep intestine as sausage casing. The bowel is transported from the abattoir in 180 l plastic barrels which are then examined by the employees of the casing manufacturer before use. The preparation of the bowel then starts with maceration and hosing to remove the contents of the bowel and its villi, leaving essentially the serosa and muscle layers. These are then

preserved with salt and transported to the sausage manufacturer. At no stage in the process are any other chemicals or preservatives used. Should there be a delay between arrival of the barrels and the subsequent preparation of their contents the bowel decomposes. (figure).

Assessment of the patients' work environment found that the onset of symptoms occurred soon after the examination of the intestine contained within each barrel. The toxic agent causing the keratoconjunctivitis was thought to be hydrogen sulphide gas (H_2S) given off as a result of anaerobic putrefaction of the bowel and its contents.

To investigate this hypothesis, lead acetate paper was exposed to the atmosphere directly over barrels containing bowel that had been delayed in transit. The paper turned black within 30 seconds, indicating the presence of hydrogen sulphide gas. Control pieces of lead acetate paper exposed to newly arrived barrels and to room air did not turn black in a period of one hour. In addition, testing with litmus paper did not indicate the presence of any alkaline gas.

Discussion

Hydrogen sulphide is a highly toxic, colourless gas easily recognisable in low concentrations by its characteristic odour of rotten eggs. At higher concentrations, about 50 to 60 ppm, the gas is recognised as producing keratoconjunctivitis, without upper respiratory tract symptoms. In much higher concentrations, around 300 to 500 ppm, the gas can be lethal.^{1,2}

Employees in a wide range of industries have been recognised as being at risk from hydrogen sulphide toxicity. The gas may be a byproduct of several industrial processes, including the manufacture of gas from coal or coke,³ the refinement of sugar,⁴ and the production of viscose rayon.⁵ It is also encountered in caissons⁶ and in the mining industry as natural gas produced by sulphurous rock, "stink damp."^{1,7}

Keratoconjunctivitis due to hydrogen sulphide is a well recognised entity and the clinical findings in this report are in accordance with those of previous



Discarded barrels: the decomposing contents are seen being forced from the barrels by gas production.

authors.^{3,4,6,8} The occurrence of H₂S keratoconjunctivitis in the sausage casing industry, however, has not to our knowledge been previously reported.

In view of the fact that delays are often unavoidable before the preparation of the bowel, and particularly in warm weather when a more rapid decomposition occurs, precautions need to be taken.

We would recommend that protective goggles be worn when examining newly arrived barrels of sheep intestine if the morbidity associated with H₂S keratoconjunctivitis is to be avoided in this setting.

References

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